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LIGHT-EMITTING DEVICE
[HAKKO SOCHI]

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Specification

1. Title of the Invention

Light-Emitting Device

2. Claims

(1) A light-emitting device, characterized in that a transparent light-transmitting part and a solar cell respectively, are laminated on a transparent substrate to integrate light emission and light reception.

(2) A light-emitting device, characterized in that a transparent light-transmitting part and a solar cell respectively, are laminated on a transparent substrate to integrate light emission and light reception; an electrode of said solar cell is connected to an electrode of said light-emitting part via a battery; and the charge of said battery and the power supply to the light-emitting part from the battery are controlled by a control part.

3. Detailed Description of the Invention

(Technical Field)

The present invention relates to a light-emitting device usable for illumination and display.

(Background Art)

[1] Numbers in the margin indicate pagination in the foreign text.

In illumination or display devices that are used outdoors as gate lamps and road signs, small-scale light-emitting devices in which wirings are not particularly required have been in demand.

For these demands, devices in which a solar cell, light-emitting diode (or fluorescent lamp), and battery are combined, are considered, however their wirings are complicated, or their shape is large. Therefore, these devices are not yet supplied in actuality.

(Purpose of the Invention)

The purpose of the present invention is to provide a light-emitting device that does not require complicated wirings, is very compact, and can save energy.

(Presentation of the Invention)

The light-emitting device of the present invention is characterized in that a transparent light-transmitting part and a solar cell respectively, are laminated on a transparent substrate (for example, a glass plate) to integrate light emission and light reception.

An application example of the present invention will be described with reference to Figures 1 and 2. In other words, in this light-emitting device, as shown in Figure 1, first transparent electrode 2, dielectric layer 3, EL luminous layer

4, dielectric layer 5, and second transparent electrode 6 are sequentially formed on a

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transparent glass substrate 1 to obtain a transparent EL light-emitting part (electric-field light-emitting device). Next, amorphous Si layers 8, 9, and 10 of N type, i type, and p type are further sequentially laminated on its upper surface to form an NiP amorphous silicon solar cell 11, and a metal electrode 12 is then formed on its upper surface by vapor deposition, etc.

As the aforementioned first and second transparent electrodes 2 and 6, a transparent ITO layer composed of a mixture of In_2O_3 and SnO_2 can be adopted, and as the dielectric layers 3 and 5, a $BaTiO_3$ layer can be adopted. In addition, as the aforementioned EL luminous layer 4, a thin film in which Mn, etc., are added as active materials to ZnS can be adopted. These respective layers can be formed by sputtering method, vapor deposition method, ion plating method, etc.

Moreover, each layer of the aforementioned solar cell 11 can be formed by plasma CVD or other various means.

The thickness of these respective layers 1, 2, …, and 12 is preferably about 1,000 Å -1 μm. Here, the aforementioned second transparent electrode 6 is a common electrode of the EL light-emitting part 7 and the solar cell 10.

In the aforementioned first and second transparent electrodes 2 and 6 and metal electrode 12, as shown in Figure 2, the metal electrode 12 is connected to a battery 14 via a control part 13, and the second transparent electrode 6 is also connected to the battery 14, so that the power generated by the solar cell 11 can be stored in the battery 14. The battery 14 is further connected with an oscillating step-up part 15 via the aforementioned control part 13, and the oscillating step-up part 15 is connected to the first and second transparent electrodes 2 and 6, supplying an energy required for the light emission to the EL light-emitting part 7. The aforementioned control part 13 is connected to a sensor 16 and controls the charge and discharge of the battery 14.

Next, the operation will be described. In other words, for a bright daytime, the EL light-emitting part 7 is not operated by the control part 13 connected to the sensor 16, and the power generated in the solar cell 11 by lights transmitted through the glass substrate 1 and the light-emitting part 7 is stored in the battery 14, charging the battery 14.

Under a dark condition, the sensor 16 senses the darkness, discharges the battery 14 via the control part 13 to supply the energy to the EL light-emitting part 7 through the oscillating step-up part 15, and makes the luminous layer 4 emit lights for

illumination or display. Here, a timer may also be used instead of the sensor 16.

In this manner, since the transparent EL light-emitting part 7 and the solar cell 11 are laminated to integrate light reception and light emission, the device itself can be extremely thinned in scale. In particular with the use of the amorphous thin film solar cell, a large-area cell can be obtained, thus being able to prepare a thin large-area display part.

In addition, complicated wirings between the solar cell 11 and the EL light-emitting part 7 are unnecessary, and the supply of energy from the outside is also unnecessary. Moreover, this device can be optimally used outdoors because of its maintenance-free characteristic.

(Effects of the Invention)

According to the light-emitting device of the present invention, complicated wirings are not required, and its structure is compact. In addition, energy-saving can be realized.

4. Brief Description of the Figures

Figure 1 is a cross section showing an application example of the present invention, and Figure 2 is its circuit diagram.

1 Glass Substrate (Transparent Substrate)

7 EL Light-Emitting Part (Transparent Light-Emitting Part)

11 Solar Cell

13 Control Part

14 Battery

Figure 1

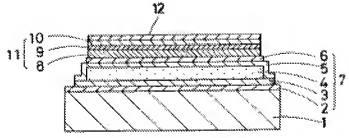
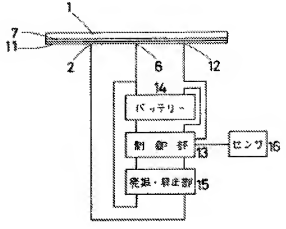


Figure 2



13 Control Part

14 Battery

15 Oscillating/Step-Up Part

16 Sensor